REMARKS

The official action of 26 May 2009 has been carefully considered and reconsideration of the application as amended is respectfully requested.

Claims 1, 6 and 14 have been amended to provide proper antecedent basis for the recited upstream and downstream ends of the claimed ultrasonic acting region and thereby to render the claims more definite without narrowing the scope thereof.

New claims 20-22 have been added more completely to define the subject matter which Applicant regards as his invention. Support for the recitations in these claims appears in the specification as filed at, for example, page 8, first full paragraph and page 9, second full paragraph (formation of water-oil mixture and subsequent step of dewatering) and Figs. 1 and 2 (single inlet for upstream end and single outlet for downstream end of ultrasonic acting region).

Claims 1-3, 6-8 and 14-16 stand rejected under 35 USC 102(b) as allegedly being anticipated by Feke et al. Claims 4, 5, 9-13 and 17-19 stand rejected as allegedly being unpatentable over Feke et al. Applicants respectfully traverse these rejections.

The claimed method is a method for demulsifying water-oil emulsions through ultrasonic action, comprising a step of making water-oil emulsions flow through at least one ultrasonic acting region in a flow direction from an upstream and to a downstream end of the ultrasonic acting region, characterized in that: within said ultrasonic acting region, a concurrent ultrasonic wave whose traveling direction is the same as the flow direction of said water-oil emulsions is generated by at least one first ultrasonic transducer provided at the upstream end of said ultrasonic acting region, and a countercurrent ultrasonic wave whose traveling direction is opposite to the flow direction of said water-oil emulsions is generated by at least one second

ultrasonic transducer provided at the downstream end of said ultrasonic acting region; and the concurrent ultrasonic wave and the countercurrent ultrasonic wave act simultaneously on the water-oil emulsions flowing through said ultrasonic acting region, so as to demulsify said water-oil emulsions.

Feke et al do not show or suggest a number of features of the claimed method. For example, Feke et al do not show or suggest the provision of first and second ultrasonic transducers provided at the respective upstream and downstream ends of an ultrasonic acting region to generate the recited concurrent and countercurrent ultrasonic waves with respective traveling directions as claimed. To the contrary, as can be seen in Fig. 1, Feke describes the flow of one component of a suspension through an ultrasonic acting region in a first direction A-B (from upstream inlet A to downstream outlet B) and the flow of a second component of the suspension through the ultrasonic acting region in a second direction A-C (from upstream inlet A to downstream outlet C). These two (2) flow directions are generated by transducers 14 and 22, both of which are provided at downstream ends of Feke's ultrasonic acting region.

To explain, in Feke, two transducers 14 and 22 are mounted at respective downstream ends. The transducer 14 generates a countercurrent ultrasonic wave at the A-B portion and generates a concurrent ultrasonic wave at the A-C portion. The transducer 22 generates a concurrent wave at the A-B portion and a countercurrent wave at the A-C portion. In other words, one transducer (14 or 22) simultaneously generates concurrent and countercurrent ultrasonic waves from a downstream end of the ultrasonic acting region. Thus, Feke does not show or suggest the provision of (a) a concurrent ultrasonic wave whose traveling direction is the same as the flow direction of a suspension that is generated by at least one first transducer provided at the upstream end of an ultrasonic acting region, or (b) a countercurrent ultrasonic wave whose traveling direction is opposite to the flow direction of the suspension that is generated by a second ultrasonic

transducer provided at the downstream end of the ultrasonic acting region.

Moreover, there could not have been any motivation or reason to modify Feke to arrive at the claimed invention. The method described by Feke is a method whose object is **to separate**, e.g., water and oil from water and oil emulsions. In contrast, the claimed invention is directed **to demulsifying** water-oil emulsions, wherein the displacement and force of the ultrasonic wave in medium particles of different densities is designed to weaken the inherent binding force of the particles of the water-oil emulsions so as to destroy the structure of the emulsions without separating the emulsion components. (After demulsification, the demulsified mixture undergoes gravity settling and dewatering under the action of an electric field; the demulsifying step does not have the function of separation.) These are totally different technical solutions. With demulsification, after passing through the acting region and undergoing the effect of an ultrasonic wave suitable for this purpose, the fluid is still in a mixed condition with the mixture proportion unchanged. With separation, after passing through the acting region and undergoing the effect of an ultrasonic wave suitable for this purpose, the particles in the fluid are separated with the proportion of the mixture flowing out of the at least two outlets being greatly different.

For this reason, there could not have been any reason to modify Feke's separation method to arrive at the claimed method of demulsifying as this would impermissibly change the principle of operation of the reference. See MPEP 2143.01(VI) ("If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.").

Thus, Feke et al strictly define their design solution to provide an apparatus and frequency requirements of an ultrasonic wave that will effect the desired separation: providing an elongated ultrasonic wave acting region and defining that the ultrasonic

wave traveling through a fluid medium is resonant in a required frequency range in the ultrasonic wave acting region; the frequency of the ultrasonic wave is a saw-tooth function varying from a minimum value f_2 to a maximum value f_1; the maximum and minimum frequency values f_1 and f_2 satisfy the following equation: $(f_1 - f_2)Lz/c=n$, where Lz is the length of the ultrasonic wave acting region, c is the velocity of sound in the fluid, and n is an integer; n equals 1; the saw-tooth function of the frequency of the ultrasonic wave is increased at a rate of 0.5 to 50 Hz/msec; the method for separating particles from a fluid suspension, comprising the steps of: (1) providing an elongated acting region having closed ends, providing the elongated acting region for separation of the suspended particles, the ultrasonic wave traveling in the fluid medium is resonant in the required frequency range in the ultrasonic acting region to urge particles toward one end of the acting region and to separate the particles; (2) providing an elongate acting region having two closed ends, the particles to be separated are suspended in the fluid medium and flow into the elongate acting region. The ultrasonic wave traveling by means of the fluid medium flowing through the acting region travels in the length direction of the acting region, the frequency is varied in frequency within a desired inherent frequency range to separate particles from the passing fluid medium and at the same time to push the separated particles toward the second end of the acting region and to remove the fluid medium from the first end of the acting region.

In short, the cited reference does not show or suggest the demulsification of the invention defined by any of the claims of record, and there would have been no motivation or reason to modify the reference to arrive at the invention defined by any of the claims of record. Accordingly, the reference does not set forth even a *prima facie* case of obviousness for the invention defined by any of the claims.

With particular respect to claims 20 and 21, the reference *a fortiori* does not show or suggest the claimed invention insofar as the acting region of the invention defined by these claims has only two openings, i.e., one inlet and one outlet. The acting

region of Feke requires at least three (3) openings, i.e., at least one fluid inlet and at least two fluid outlets.

With particular respect to claim 20 and 22, the claims are further distinguishable from the reference insofar as they require separate separation steps which would not be used in conjunction with Feke's separation method (which achieves separation in a different manner) and there accordingly would be no reason or motivation to modify Feke to arrive at the invention defined by these claims.

With particular respect to claims 4 and 5, the claims limit the sound intensity of the countercurrent ultrasonic waves in the claimed method based upon Applicants' recognition that such limitation of sound intensity can avoid cavitation of water-oil emulsions. The Examiner considers that such limitation would have been obvious as the optimization of the recited parameter, but this respectfully ignores the fact that Feke does not even recognize that the claimed parameter is a result effective variable. To the contrary, in a method such as described in Feke, wherein two arrays of waves of different frequencies travel in a single direction, the arrays cannot intervene to overlap and to form cavitation waves. Accordingly, and in the absence of anything in Feke to show the result effective nature of this variable, it could not have been obvious to optimize the same. See MPEP 2144.05(II)(B) ("A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.").

In view of the above, Applicants respectfully submit that all of the prior art rejections of record have been overcome and that the application is now in allowable form. An early notice of allowance is earnestly solicited and is believed to be fully warranted.

Respectfully submitted,

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